

Proposed Amendments to the Zero Emission Vehicle Regulation

March 27-28, 2003

Overview

- Background
- Description of proposed changes
- Summary and staff recommendation

Background

- Overview of regulation
- Program goals
- Program achievements
- Why are amendments needed?
- Staff objectives

Overview of Regulation

10 % Mandate

6 %

PZEV



2 %



ZEV

2 %

AT-PZEV



ZEV Program Categories

<u>Category</u>	<u>Typical Vehicles</u>
Gold	Battery EV, hydrogen fuel cell
Silver	CNG, hybrid, hydrogen ICE, grid connect hybrid, methanol fuel cell
Bronze	Extremely clean gasoline ICE

Program Goals

- Achieve significant air quality benefits
- Push research, development and deployment of zero emission vehicles
- Encourage ZEV commercialization through introduction of ZEV-enabling technology

Program Achievements

- ZEV program has resulted in
 - Significant efforts to advance battery technology
 - More than 2,500 battery electric vehicles leased or sold in California
 - Ten near-zero emission PZEV models currently certified
 - Three hybrid electric vehicles on sale, others announced
 - Air quality benefit

California Fuel Cell Partnership

- Membership

Ford Motor Company

DAIMLERCHRYSLER

HONDA

NISSAN

 **TOYOTA**


HYUNDAI



Shell Hydrogen



ExxonMobil



UTC Fuel Cells
A United Technologies Company

BALLARD®

California Environmental Protection Agency



Air Resources Board



- Goals

- Vehicles



Other Developments

- Freedom CAR



- National and international commitment to ZEV technology

Why Are Amendments Needed?

- Address legal challenges
- Align requirements with technology and market status

Address Legal Challenges

- Federal preemption lawsuit
 - Preliminary injunction issued June 2002
 - Appeal argued February 2003
- First state court lawsuit
- Second state court lawsuit

Technology Status--BEV

- 2001 Biennial Review showed incremental cost of \$7k-\$9k for full function EV battery pack, in volume production
- Recent advances in cycle life, but fundamental cost challenges remain
- Sustainable demand in near term appears to be small
- Major manufacturers have ceased production

Technology Status--Fuel Cell

- Technology shows great promise, and manufacturers appear to see business case
- Significant cost, manufacturing and performance challenges
- Not ready for volume production

ZEV Status--Overview

- Development needed before any ZEV technology ready for mass deployment
- 2001 requirements too ambitious
 - Force BEV production regardless of perceived long term prospects
 - Dilute manufacturer efforts
- Pace of future development difficult to predict

Technology Status--AT PZEV

- CNG vehicles in commercial production
- Three HEVs on market, others announced
 - Not yet AT PZEV, but future versions expected to qualify
- Hydrogen ICE vehicles demonstrated
- Plug in hybrid vehicles being studied

Technology Status--PZEV

- 10 models certified
- About 140,000 expected to be sold in model year 2003

Staff Objectives

- Restart program
 - Take advantage of technologies in showrooms today
 - Capture air quality benefits!
 - Build manufacturing and supplier base for pure ZEV technologies

Staff Objectives

- Avoid mismatch between program requirements and technology status
- Recognize successful compliance under 2001 rules
- Provide compliance pathway for aggressive pursuit of fuel cell commercialization

Summary of Proposed Amendments: History

- Strawman proposal, November 2002
- Public workshop, December 2002
- Initial Statement of Reasons, January 10, 2003
- Staff's additional proposed modifications, March 5, 2003

Summary of Proposed Amendments: Overview

- Program start
- Category percentages
- Credit calculations
- Early production incentives
- Clarifying and balancing amendments

Summary of Proposed Amendments: Program Start Date

- Program start in 2005 instead of 2003
- Earliest practical start date
- Allows adequate lead time
- Pick up from 2001 Amendments

Summary of Proposed Amendments: Two Paths

- Base Path
- Alternative Compliance Path

Overview of Regulation

10 % Mandate

6 %

PZEV



2 %

2 %

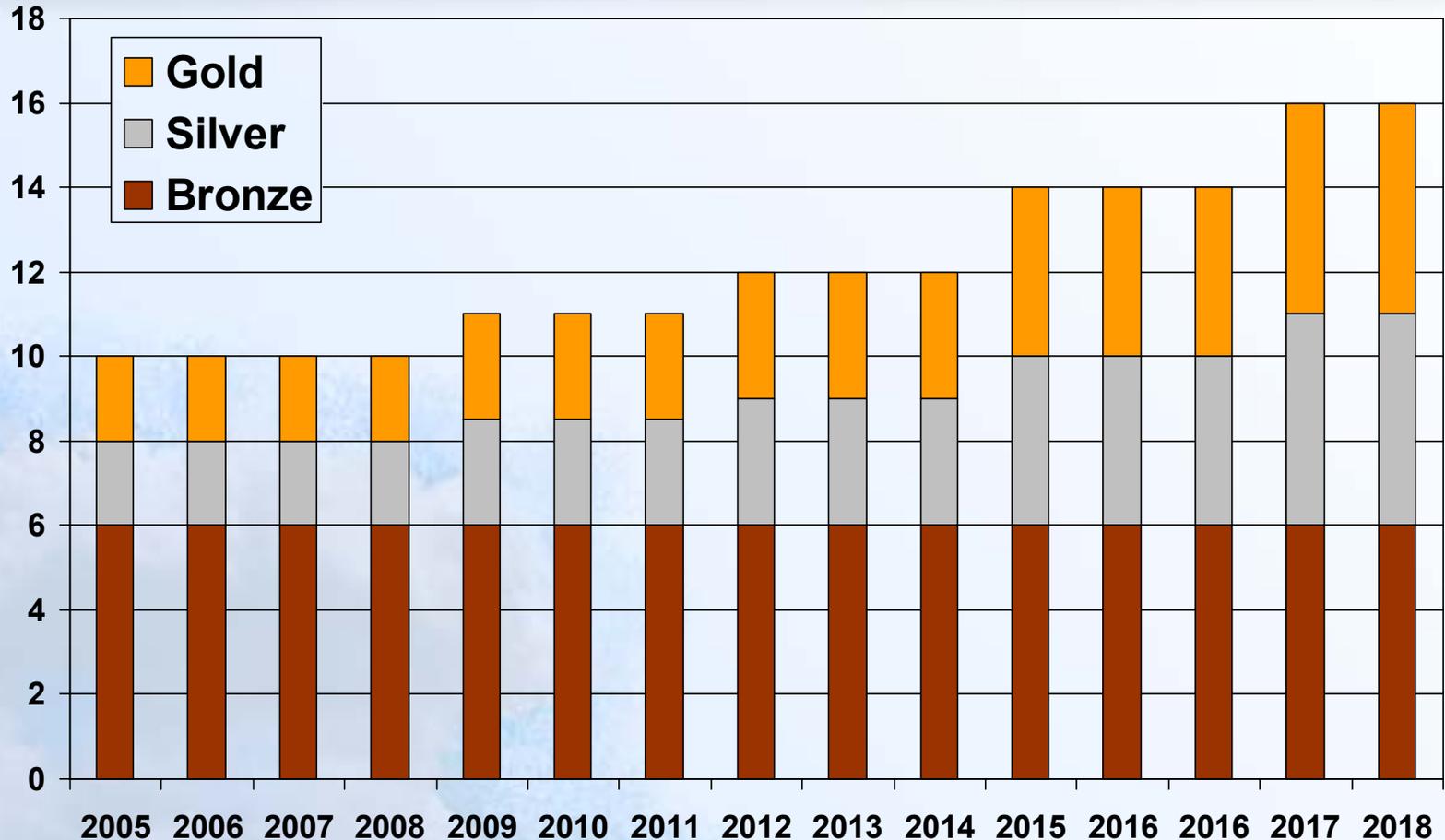
AT PZEV



ZEV



Percentage Requirement



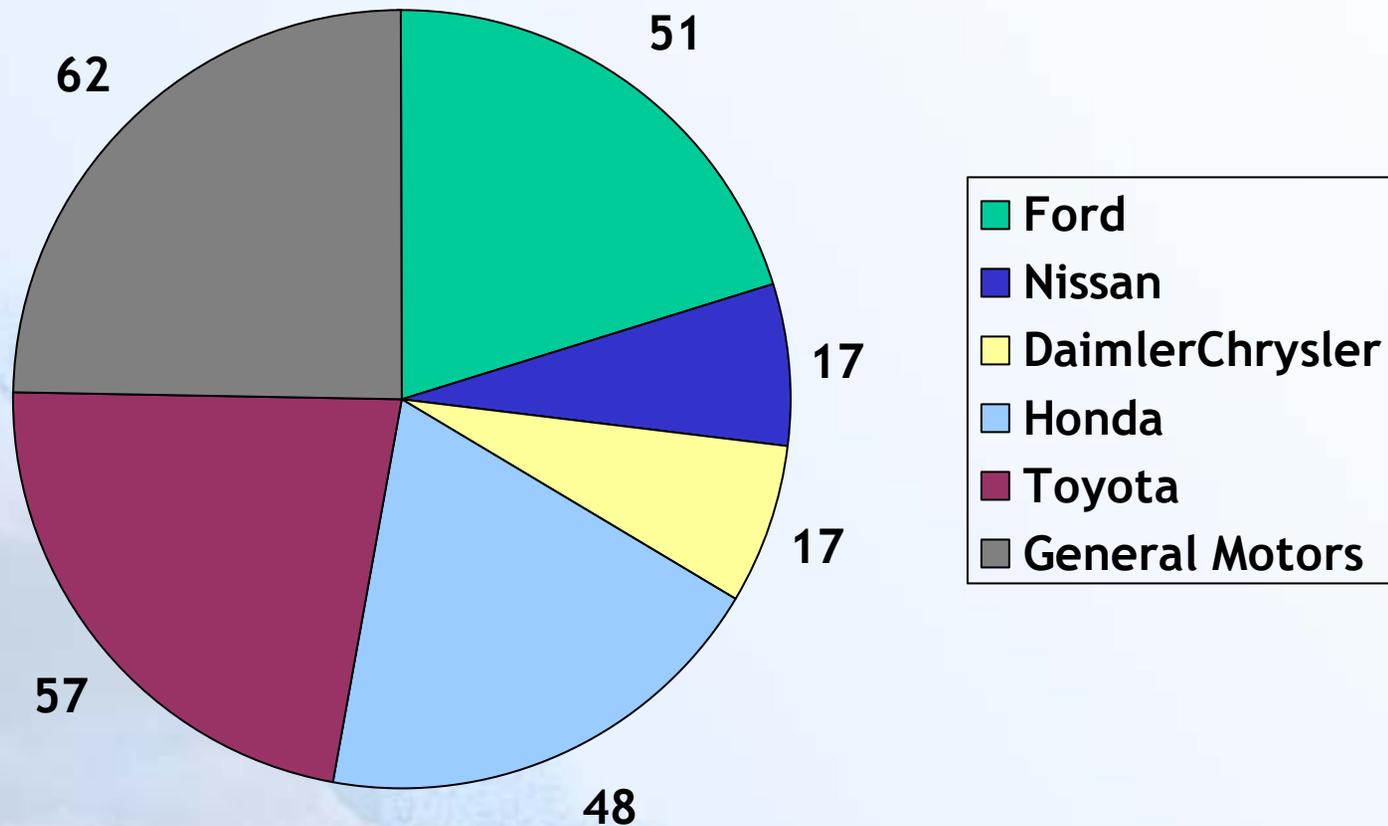
Summary of Proposed Amendments: Base Path

- Preserve 2001 regulation structure
- Percentage ZEV requirements
 - 2 % Gold
 - 2 % Silver
 - 6 % Bronze
- Allow use of banked credits
 - Some manufacturers able to comply with banked credits through 2008 and may use base path

Summary of Proposed Amendments: Alternative Compliance Path

- Market share of 250 type III ZEVs (fuel cell vehicles) placed between 2001 and 2008
- Remaining gold obligation may be met with silver
- Post 2008 requirement to be determined

Manufacturer Market Share of 250 Type III (fuel cell vehicle) ZEVs



Summary of Proposed Amendments: Independent Expert Review Panel

- Independent experts
- Assess ZEV technologies
 - Fuel cell and battery
 - Technology readiness
 - Market readiness
- California Fuel Cell Partnership a key resource

Summary of Proposed Amendments: Independent Expert Review Panel

- Report to the Board prior to setting post-2008 ZEV requirements
- Provide Board with data necessary to define future ZEV requirement

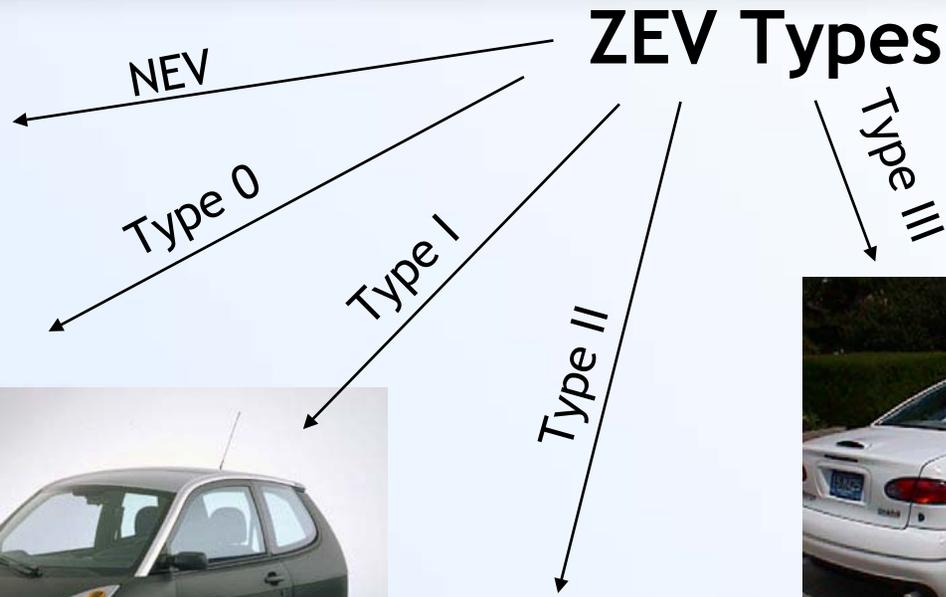
Summary of Proposed Amendments: Credit Calculation

- Credit calculations
 - ZEVs
 - AT PZEVs

Summary of Proposed Amendments: Proposed Changes to ZEV Credit

- Remove efficiency multiplier
- Create categories of ZEV types
 - NEV, Type 0, Type I, Type II, Type III
- Simplified calculation
- Adjust credit levels over time

Summary of Proposed Amendments: ZEV Types



Summary of Proposed Amendments: ZEV Credit Calculation

	Stage I			Stage II			Stage III			
Tier	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012+
NEV	1.25	0.625	0.625	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Type 0 (Utility)	1.5	1.5	1.5	1.5	1.5	1.5	1	1	1	1
Type 1 (City EV)	8	8	8	7	7	5	2	2	2	2
Type 2 (FF EV)	12	12	12	10	10	7	3	3	3	3
Type 3 (Fuel Cell)	40	40	40	40	40	40	4	4	4	3

Summary of Proposed Amendments: Anatomy of AT PZEV Credit

- AT-PZEVs earn PZEV base credit of 0.2 plus:
 - Zero Emission Range (ZER) credit
 - Advanced ZEV Componentry credit
 - Low Fuel Cycle Emissions credit
- Staff proposes modifications to all three of these AT PZEV components

Summary of Proposed Amendments: HEV Advanced ZEV Componentry Credit

- In 2001 amendments, HEVs treated according to
 - CO2 reduction,
 - Percent Peak Power, or
 - Efficiency
- Proposed amendments credit based only on the electric drive system
 - Voltage,
 - Peak power, and
 - ZEV-like attributes

Summary of Proposed Amendments: HEV Advanced Componentry Credit

	Low Voltage/ Low Power HEV	High Voltage HEV	High Voltage/ High Power HEV
Drive System Voltage	Low	High	High
Drive System Min. Peak Power	4 kW	10 kW	50 kW
Traction Drive Boost	Yes	Yes	Yes
Regenerative Braking	Yes	Yes	Yes
Idle Stop/ Start	Yes	Yes	Yes
MY '05 – '07 AT Credit	0	0.4	0.5
Total ATPZEV Credit	0.2	0.6	0.7

Summary of Proposed Amendments:

Other Proposed ATPZEV Modifications

- Zero Emission Range
 - Method of calculation changed
 - Maximum credit capped at 1.5
- Advanced Componentry
 - May be combined with ZER
 - H2 storage increased from 0.2 to 0.3
 - Bi-Fuel CNG/H2 now earns same as H2
 - Battery warranty requirement reduced
- Low Fuel Cycle Emissions
 - Increased maximum credit from 0.2 to 0.3

Summary of Proposed Amendments: Credit for CNG Vehicles

	Base	Zero Emissions Range	Advanced Componentry	LFCE	TOTAL
2001 Amendments CNG	0.2	N/A	0.1	0.2	0.5
Proposed CNG	0.2	N/A	0.2	0.3	0.7



Summary of Proposed Amendments: Credit for Hydrogen ICE

	Base	Zero Emissions Range	Advanced Componentry	LFCE	TOTAL
2001 Amendments H2 ICE	0.2	1.0	N/A	0.2	1.4
Proposed H2 ICE	0.2	1.5	0.3	0.3	2.3
Proposed H2ICE HEV (Ford Model "U")	0.2	1.5	0.7	0.3	2.7

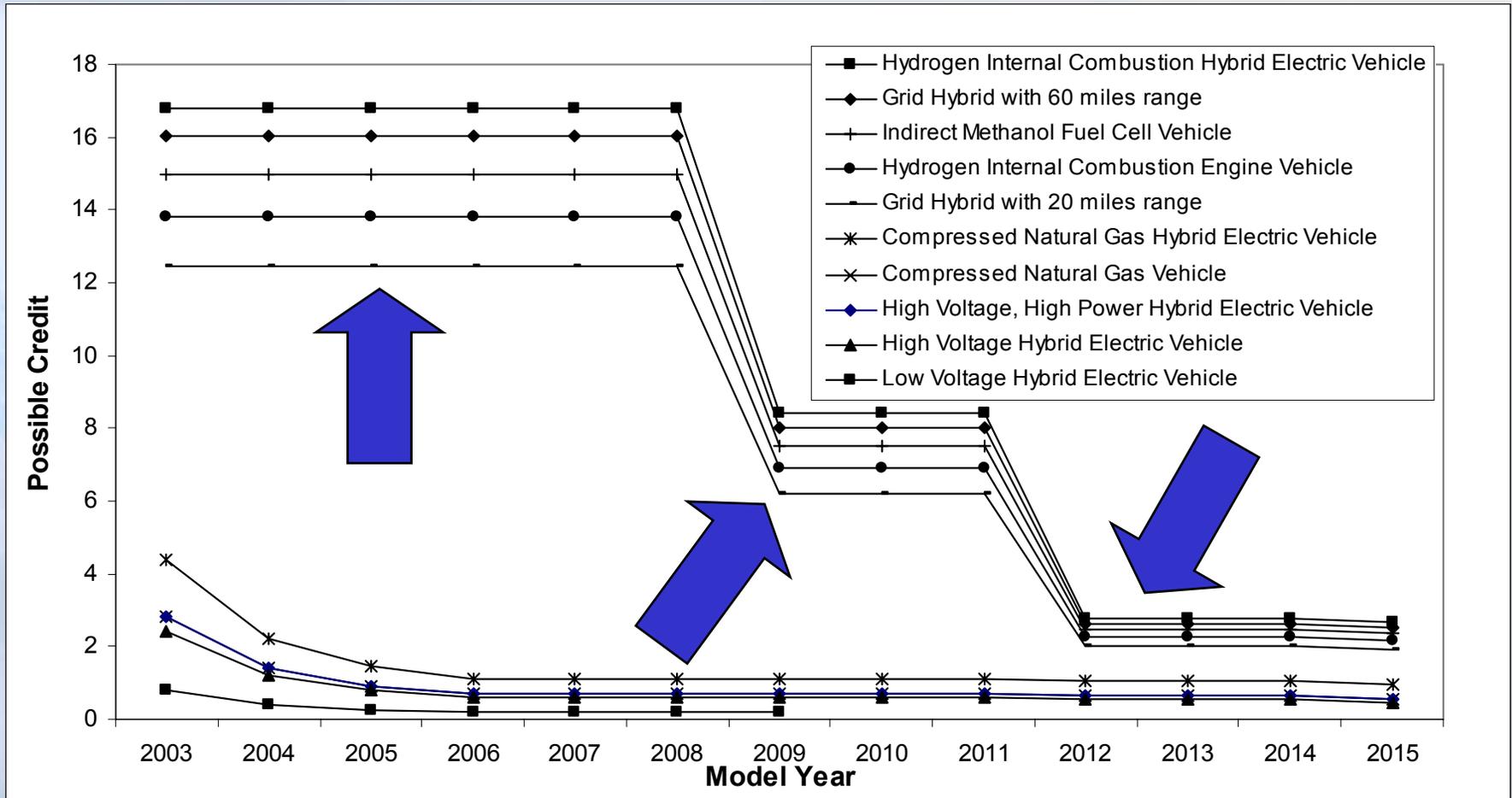


Summary of Proposed Amendments: Credit for Plug-In HEVs

	Base	Zero Emissions Range	Advanced Componentry	LFCE	TOTAL
2001 Amendments P20 HEV	0.2	0.6	N/A	0.1	0.9
Proposed P20 HEV	0.2	1.25	0.5	0.12	2.1



Summary of Proposed Amendments: Overall AT-PZEV Credits



Summary of Proposed Amendments: Early Production Incentives

- Incentivize manufacturers to maximize PZEV production
- “Excess” PZEVs produced in 2003 and 2004 can be used for silver category until 2006

Summary of Proposed Amendments: Clarifying and Balancing Amendments

- Section 177 (travel) provision
- Addition of LDT 2
- Transportation system credit
- Placed in service date
- Banked NEV credit cap
- Severability

Summary of Proposed Amendments: Section 177 (travel) provision

- Other states able to adopt LEV/ZEV regulations
- Result: Increases automaker obligation by 1.7 X
- Provision proposed:
 - Allow Type III ZEVs placed in any ZEV state to count towards compliance



Summary of Proposed Amendments: Inclusion of LDT 2 volumes

- Board directed staff to include LDT 2 in 2001
- Issues regarding notice requirements have been raised
- Asking the Board to reaffirm the inclusion of LDT 2 volumes



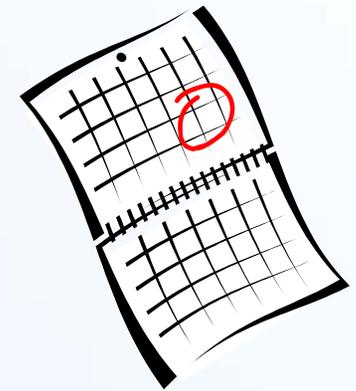
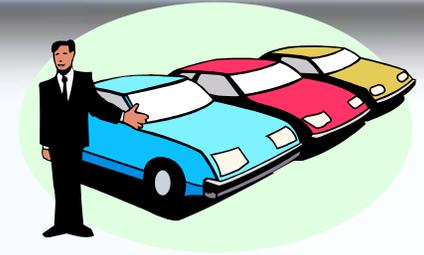
Summary of Proposed Amendments: Transportation system credit

- Additional credit awarded for ZEVs placed in transportation systems
- 2001 Amendments: Sunset credit in 2008
- Proposed Amendments: Extend credit to 2011



Summary of Proposed Amendments: Placed in service date

- Applies to application of early introduction credits
- September 30, 2003 for model year 2002 vehicles
- June 30 for subsequent model years



Summary of Proposed Amendments: Banked NEV credit cap

- 2001 Amendments: Banked NEV credit cap applied to gold, silver and bronze
- Proposed Amendments: Banked NEV credit cap applied to gold and silver
- Banked NEV Credit Cap:
 - Up to 75 % of obligation may be met with banked NEV credit
 - 2006 gold, 2009 silver
 - Up to 50 % of obligation may be met with banked NEV credit
 - 2007 gold, 2010 silver



Severability

- Background
 - Severability clause expresses intent that if one element of regulation is invalidated, the remainder can still be enforced
 - Relevant to key question before court--what would agency have done if precluded from adopting invalid provision?
 - No severability clause in 2001 amendments

Severability

- Federal trial court held that AT PZEV provisions for HEVs were not severable
 - Unclear to court whether Board would have proceeded with regulation if regulation did not result in improved fuel economy
 - AT PZEV provisions critical to intended reduction in number of pure ZEVs

Severability

- Proposed regulation amendments contain both general severability clause and additional clause specifically addressing AT PZEV provisions on hybrids
- Proposed resolution contains finding that if AT PZEV provisions on hybrids or alternative compliance path are found preempted, Board chooses to enforce remainder of 2003 amendments rather than fall back on current ZEV regulation when enforcement has been enjoined

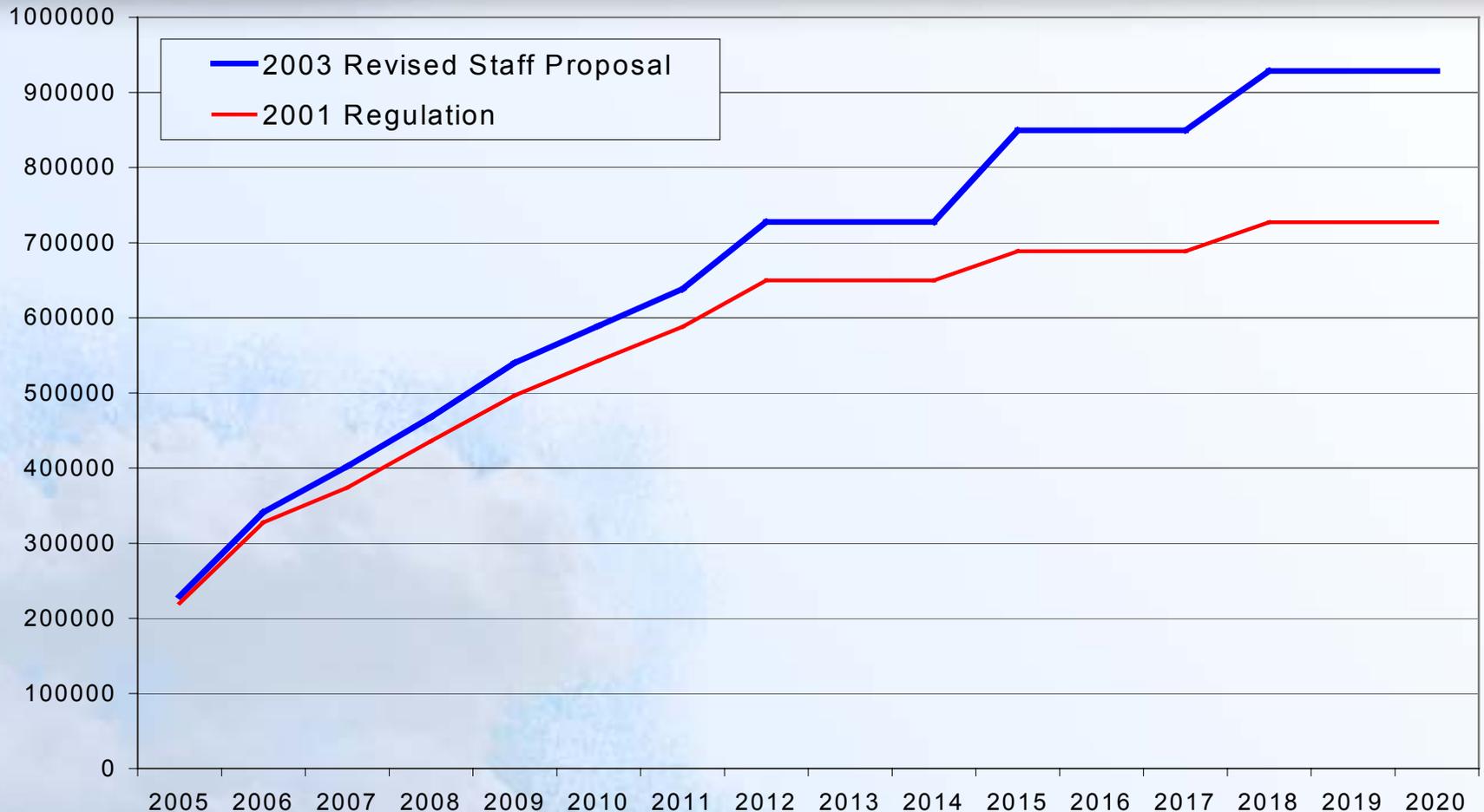
Summary and Staff Recommendation

- Effects of proposed changes
 - Number of vehicles
 - Air quality
- Major issues
- Staff recommendation

Number of Vehicles

- Not possible to provide firm estimates
 - Program provides great flexibility
 - Post-2008 ZEV requirement under alternative compliance option to be determined
- Overall effect
 - Reduce number of ZEVs and increase number of AT PZEVs
 - PZEV totals not significantly affected

Number of Clean Vehicles (ZEVs plus AT PZEVs plus PZEVs)



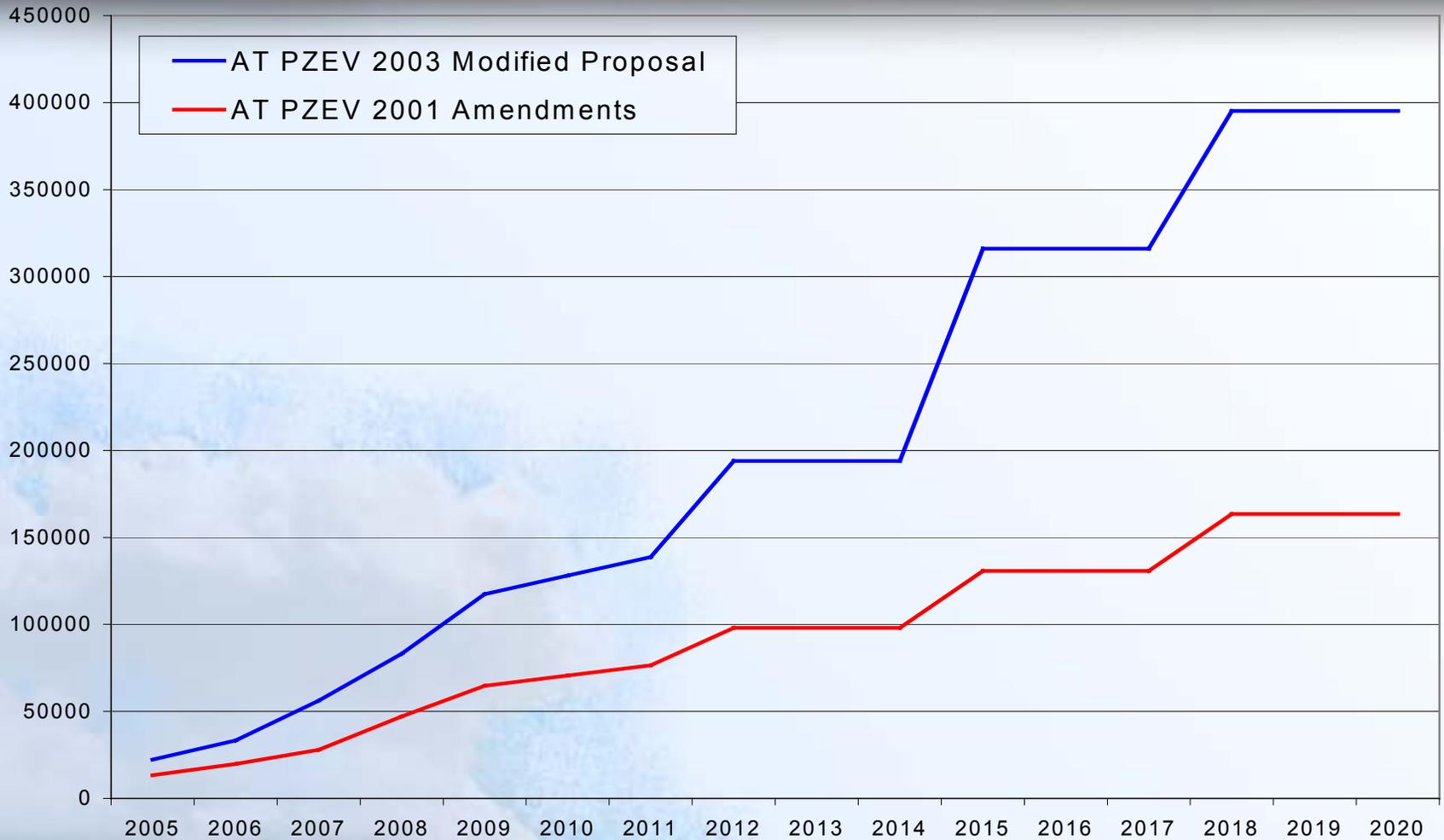
Number of Vehicles--ZEVs

- On base path
 - Requirement is 2 percent gold, but banked credits may be used
- On alternative compliance path
 - Total (for all manufacturers) is 250 fuel cell vehicles between 2001 and 2008
 - Production level for 2009 and beyond to be determined by Board after input from Independent Expert Review Panel

Number of Vehicles--AT PZEVs

- In near term, depends on manufacturer capability and strategy regarding use of banked credits
- In long term, AT PZEV total will change in response to ZEV requirement in effect at that time

AT PZEVs--2003 vs. 2001



AT PZEVs-- Effect of ZEV Requirement



Air Quality Impacts

	ROG	NOx
Net change from 2001 amendments		
2010	-0.03	-0.06
2020	-0.04	-0.17
Net change from no ZEV program		
2010	-0.38	-1.02
2020	-3.28	-2.23

- Will also reduce CO and air toxics

Major Issues

- ZEV requirement under alternative compliance option in MY 2009 and beyond
- Role of BEVs
- Long term silver production levels
- ZEV credit for infrastructure

ZEV Requirement for MY 2009 and Beyond

- Issue
 - ZEV requirement for model years 2009 and beyond under alternative compliance option is “to be determined”, following input from Independent Technical Advisory Panel
 - Staff recommends this approach because timing for ramp up of vehicle production is difficult to predict

ZEV Requirement for MY 2009 and Beyond

- Stakeholder views--environmental
 - Long term technology-forcing goal is needed to promote competition to achieve the next generation of ZEV technologies
 - Manufacturer public statements predict rapid pace of development

ZEV Requirement for MY 2009 and Beyond

- Stakeholder views--automaker
 - Appropriate goal for 2009 timeframe cannot be predicted at this time
 - Overly ambitious goal is not credible and if enforced will waste resources

ZEV Requirement for MY 2009 and Beyond

- Options
 - Retain staff proposal
(future quantity to be determined)
 - Continue demonstration level requirement
(e.g. 250 vehicles)
 - Establish higher target level
(e.g. 10 x first stage)

ZEV Requirement for MY 2009 and Beyond

- Staff response
 - To achieve commercialization, a ramp up must occur
 - The question is when
 - Staff has explained rationale for our approach, but recognizes Board may wish to establish a firm target

Role of BEVs

- Issue
 - Manufacturers must build Type III ZEVs (fuel cells) in order to qualify for alternative compliance option
 - Should proposal allow for other types of ZEVs?

Role of BEVs

- Stakeholder views
 - Proposed requirement does not provide incentive for ongoing development of BEV technology

Role of BEVs

- Options
 - Require BEV production in addition to fuel cells
 - Allow BEVs to meet some portion of required minimum production requirement

Role of BEVs

- Staff response
 - Staff recommends that BEVs be allowed to satisfy portion of minimum production requirement
 - Should be option rather than requirement
 - Keep minimum number of fuel cells (e.g. one half of obligation)
 - Set appropriate credit ratio

Silver Production Levels

- Issue

- Long term silver production levels will vary with ZEV requirement
- If ZEV requirement remains at low levels, silver volumes are high in 2012 and beyond
- Purpose of silver category is to push design improvement and cost reduction for ZEV-enabling technologies



Silver Production Levels

- Stakeholder views--automaker
 - Long term silver production exceeds what is necessary to achieve design improvement and economies of scale
 - Market may not absorb the required number of vehicles

Silver Production Levels

- Stakeholder views--environmental
 - High volume silver production needed to bring down ZEV cost
 - Requirement should be more stringent, not less

Silver Production Levels

- Options
 - Use Independent Expert Review Panel to assess silver technology status
 - Amend silver requirement

Silver Production Levels

- Staff response
 - Levels shown in staff report will decline as ZEV production expands
 - Staff recommends that long term silver status be included in Independent Expert Review Panel review
 - Have economies of scale been achieved?
 - Is technology optimized?
 - Does additional silver production contribute to ZEV commercialization?

Credit for Infrastructure

- Issue

- Emerging interest in “smart mobility corridors”
- ZEV regulation already supports some aspects (clean mobility, station cars)
- Are there opportunities for further synergy?



Credit: ZEV NET

Credit for Infrastructure

- Stakeholder views--automaker
 - Regulatory structure should not imply that infrastructure is manufacturer responsibility
 - Some indication of interest if properly structured

Credit for Infrastructure

- Stakeholder views--environmental
 - Providing option increases manufacturer flexibility and helps enable ZEV commercialization

Credit for Infrastructure

- Options
 - Allow ZEV credit for placement of hydrogen infrastructure
 - Explore other incentives and non-regulatory approaches

Credit for Infrastructure

- Staff response
 - Fruitful area to investigate, but many complex issues
 - Staff recommends report back to Board in three months

Staff Recommendation

- Staff recommends approval of the proposed amendments
 - Increase air quality benefit
 - Address litigation issues
 - Maintain progress towards transforming California's vehicle fleet to zero emissions